We claim:

1. A method of coating a substrate comprising:

forming a liquid medium containing a water swellable polymer, a solvent and a powder of one or more antimicrobial metals formed with atomic disorder;

coating the substrate from the liquid medium to provide a gel coating that adheres to the substrate, and becomes antimicrobial and anti-inflammatory when wet.

2. The method of claim 1, wherein the one or more antimicrobial metals is formed with sufficient atomic disorder such that, in contact with an alcohol or water-based electrolyte, the coating releases ions, atoms, molecules or clusters of the antimicrobial metal on a sustainable basis.

3. The method of claim 2, wherein the water swellable polymer is a lubricious polymer to provide a lubricious coating on the substrate that becomes lubricious when wet, and which further comprises drying the coated substrate.

4. The method of claim 3, wherein the lubricious polymer is a hydrophilic polymer which is provided either in powder form, or in a form coated with the one or more antimicrobial metals.

5. The method of claim 4, wherein the lubricious polymer is one or more of cellulose and derivatives thereof, polyvinyl alcohol, starch, glycogen, gelatin, pectin, alginate, chitosan, chitin, gum arabic, locust bean gum, karaya gum, gum tragacanth, ghatti gum, agar-agar, carrageenans, carob gum, guar gum, and xanthan gum.

6. The method of claim 4, wherein the lubricious polymer is selected from one or more of carboxymethyl cellulose, polyvinyl alcohol, and alginate.

7. The method of claim 6, wherein the antimicrobial metal is one or more of Ag, Au, Pd or Pt, and wherein the antimicrobial metal powder is nanocrystalline.

8. The method of claim 1, wherein the substrate is one or more of catheters, urinary catheters, in-dwelling catheters, drainage catheters, venous catheters, arterial catheters, central line and peripheral line catheters, cannulas, endoscopes, laparoscopes, sutures, staples, myringotomy tubes, wound or nasal packings, dressings, gauze, bone screws, halo screws, total joints, vascular grafts, hernia meshes, guide wires, needles, wound drains, pacemaker leads, condoms, contact lenses, peristaltic pump chambers, arteriovenous shunts, gastroenteric feed tubes, endotracheal tubes, gloves and implants.

9. The method of claim 7, wherein the substrate is one or more of catheters, urinary

catheters, in-dwelling catheters, drainage catheters, endoscopes, laparoscopes, myringotomy tubes, dressings, gauze, total joints, vascular grafts, hernia meshes, guide wires, needles, wound drains, pacemaker leads, condoms, contact lenses, peristaltic pump chambers, arteriovenous shunts, gastroenteric feed tubes, endotracheal tubes, gloves and implants.

10. The method of claim 9, wherein the grain size of the antimicrobial metal powder is less than 50 nm.

11. The method of claim 9, wherein the grain size of the antimicrobial metal powder is less than 40 nm.

12. The method of claim 9, wherein the grain size of the antimicrobial metal powder is less than 25 nm.

13. The method of claim 10, wherein the particle size of the antimicrobial metal powder is less than 100 μM.

14. The method of claim 11, wherein the particle size of the antimicrobial metal powder is less than 40 μm.

15. The method of claim12, wherein the particle size of the antimicrobial metal powder is less than 10 μm.

16. The method of claim 13, wherein the amount of the polymer in the solvent is in the range of 0.1 to 10 wt%.

17. The method of claim16, wherein the amount of the antimicrobial metal is in the range of 0.001 to 30 wt%.

18. The method of claim 16, wherein the amount of the antimicrobial metal is in the range of 0.1 to 5 wt %.

19. The method of claim 16, wherein the amount of the antimicrobial metal is in the range of 1 to 3 wt %.

20. The method of claim 19, wherein the solvent is selected from water, methanol, ethanol, propanol and DMSO.

21. The method of claim 19, wherein the solvent is water.

22. The method of claim 21, wherein the antimicrobial metal is Ag, formed as a composite with oxygen.

23. The method of claim 1, wherein the coating includes one or more agents selected from preservatives, texturizing agents, thickeners, anticoagulants, β-glucan, hormones, hyaluronic acid, cytokines, and bone morphogenetic proteins, in a therapeutically acceptable amount.

24. The method of claim 22, wherein the coating includes one or more agents selected from preservatives, texturizing agents, thickeners, anticoagulants, β-glucan, hormones, hyaluronic acid, cytokines, and bone morphogenetic proteins, in a therapeutically acceptable amount.

25. The method of claim 22, wherein the coating includes one or more agents selected from methyl paraben, propyl paraben, polyvinyl alcohol, heparin, β-glucan, epidermal growth factor, platelet derived growth factor, and transforming growth factor, in a therapeutically acceptable amount.

26. The method of claim 1, wherein the coating includes less than 0.01 % wt of glycerin, glycerols, chloride salts, aldehydes, ketones, long chain alcohols and triethanolamine

27. The method of claim 25, wherein the coating includes less than 0.01 % wt of glycerin, glycerols, chloride salts, aldehydes, ketones, long chain alcohols and triethanolamine.

28. A substrate coated with a water swellable gel coating comprising:

a substrate; and

a water swellable gel coating adhering to the substrate, wherein the gel coating includes a water swellable polymer and one or more antimicrobial metals formed with atomic disorder, and wherein the gel coating becomes antimicrobial and anti-inflammatory when wet.

29. The coated substrate of claim 28, wherein the one or more antimicrobial metals is formed with sufficient atomic disorder such that, in contact with an alcohol or water-based electrolyte, the coating releases ions, atoms, molecules or clusters of the antimicrobial metal on a sustainable basis.

30. The coated substrate of claim 29, wherein the water swellable polymer is a lubricious polymer to provide a lubricous coating on the substrate that becomes lubricious when wet.

31. The coated substrate of claim 30, wherein the lubricous polymer is a hydrophilic polymer which is provided either in a powder form, or in a form coated with the one or more antimicrobial metals.

32. The coated substrate of claim 31, wherein the lubricious polymer is one or more of cellulose and derivatives thereof, polyvinyl alcohol, starch, glycogen, gelatin, pectin, alginate, chitosan, chitin, gum arabic, locust bean gum, karaya gum, gum tragacanth, ghatti gum, agar-agar, carrageenans, carob gum, guar gum, and xanthan gum.

33. The coated substrate of claim 31, wherein the lubricious polymer is selected from one

or more of carboxymethyl cellulose, polyvinyl alcohol, and alginate.

34. The coated substrate of claim 33, wherein the antimicrobial metal is one or more of Ag, Au, Pd or Pt, and wherein the antimicrobial metal powder is nanocrystalline.

35. The coated substrate of claim 28, wherein the substrate is one or more of catheters, urinary catheters, in-dwelling catheters, drainage catheters, venous catheters, arterial catheters, central line and peripheral line catheters, cannulas, endoscopes, laparoscopes, sutures, staples, myringotomy tubes, wound or nasal packings, dressings, gauze, bone screws, halo screws, total joints, vascular grafts, hernia meshes, guide wires, needles, wound drains, pacemaker leads, condoms, contact lenses, peristaltic pump chambers, arteriovenous shunts, gastroenteric feed tubes, endotracheal tubes, gloves and implants.

36. The coated substrate of claim 34, wherein the substrate is one or more of catheters, urinary catheters, in-dwelling catheters, drainage catheters, endoscopes, laparoscopes, myringotomy tubes, dressings, gauze, total joints, vascular grafts, hernia meshes, guide wires, needles, wound drains, pacemaker leads, condoms, contact lenses, peristaltic pump chambers, arteriovenous shunts, gastroenteric feed tubes, endotracheal tubes, gloves and implants.

37. The coated substrate of claim 36, wherein the grain size of the antimicrobial metal powder is less than 50 nm.

38. The coated substrate of claim 36, wherein the grain size of the antimicrobial metal powder is less than 40 nm.

39. The coated substrate of claim 36, wherein the grain size of the antimicrobial metal powder is less than 25 nm.

40. The coated substrate of claim 37, wherein the particle size of the antimicrobial metal powder is less than 100 μM.

41. The coated substrate of claim 38, wherein the particle size of the antimicrobial powder is less than 40 μm.

42. The coated substrate of claim 39, wherein the particle size of the antimicrobial powder is less than 10 μm.

43. The coated substrate of claim 40, wherein the amount of the antimicrobial metal in the coating when wet is in the range of 0.001 to 30 wt%.

44. The coated substrate of claim 42, wherein the amount of the antimicrobial metal in the coating is in the range of 0.01 to 5 wt %.

45. The coated substrate of claim 42, wherein the amount of the antimicrobial metal in the coating is in the range of 1 to 3 wt %.

46. The coated substrate of claim 45, wherein the antimicrobial metal is Ag, formed as a composite with oxygen.

47. The coated substrate of claim 28, wherein the coating includes one or more agents selected from preservatives, texturizing agents, thickeners, anticoagulants, β-glucan, hormones, hyaluronic acid, cytokines, and bone morphogenetic proteins, in a therapeutically acceptable amount.

48. The coated substrate of claim 46, wherein the coating includes one or more agents selected from preservatives, texturizing agents, thickeners, anticoagulants, β-glucan, hormones, hyaluronic acid, cytokines, and bone morphogenetic proteins, in a therapeutically acceptable amount.

49. The coated substrate of claim 46, wherein the coating includes one or more agents selected from methyl paraben, propyl paraben, polyvinyl alcohol, heparin, β-glucan, epidermal growth factor, platelet derived growth factor, and transforming growth factor, in a therapeutically acceptable amount.

50. The coated substrate of claim 28, wherein the coating includes less than 0.01 % wt of glycerin, glycerols, chloride salts, aldehydes, ketones, long chain alcohols and triethanolamine

51. The coated substrate of claim 49, wherein the coating includes less than 0.01 % wt of glycerin, glycerols, chloride salts, aldehydes, ketones, long chain alcohols and triethanolamine.

52. A kit for coating a substrate comprising:

a water swellable polymer;

a powder of one or more antimicrobial metals formed with atomic disorder; and

optionally a solvent for the water swellable polymer.

53. The kit of claim 52, wherein the one or more antimicrobial metals is formed with sufficient atomic disorder such that, in contact with an alcohol or water-based electrolyte, the coating releases ions, atoms, molecules or clusters of the antimicrobial metal on a sustainable basis.

54. The kit of claim 53, wherein the water swellable polymer is a lubricious polymer to provide a lubricious coating on the substrate that becomes lubricous when wet.

55. The kit of claim 54, wherein the lubricious polymer is a hydrophilic polymer which is provided either in a powder form, or in a form coated with the one or more antimicrobial metals.

56. The kit of claim 55, wherein the lubricious polymer is one or more of cellulose and derivatives thereof, polyvinyl alcohol, starch, glycogen, gelatin, pectin, alginate, chitosan, chitin, gum arabic, locust bean gum, karaya gum, gum tragacanth, ghatti gum, agar-agar, carrageenans, carob gum, guar gum, and xanthan gum.

57. The kit of claim 55, wherein the lubricious polymer is selected from one or more of carboxymethyl cellulose, polyvinyl alcohol, and alginate.

58. The kit of claim 57, wherein the antimicrobial metal is one or more of Ag, Au, Pd or Pt, and wherein the antimicrobial metal powder is nanocrystalline.

59. The kit of claim 58, wherein the lubricious polymer and the antimicrobial metal are provided with a solvent for the polymer in a container for application to the substrate as a lubricious gel, or wherein the lubricious polymer and the one or more antimicrobial metals are provided separate from the solvent, for mixing prior to application to the substrate.

60. The kit of claim 59, wherein the antimicrobial metal is Ag, formed as a composite with oxygen.

61. A method of forming a metal powder comprising:

sputtering a metal coating in a sputtering apparatus equipped to sputter onto a moving or rotating surface; and

scraping the coating off the moving or rotating surface with one or more scrapers to form a metal powder.

62. The method as set forth in claim 61, wherein the moving or rotating surface is a continuous belt or rotating cylinder, and wherein the one or more scrapers are suspended above the belt or cylinder to contact the coating at an angle sufficient to remove the coating from the belt or cylinder.

63. The method as set forth in claim 62, wherein the belt is a metal belt in a magnetron sputtering roll coater.

64. The method as set forth in claim 63, wherein the metal is one or more antimicrobial metals.

65. The method as set forth in claim 64, wherein the antimicrobial metal is one or more of Ag, Au, Pd or Pt, and wherein the sputtering is conducted in an oxygen-containing

atmosphere under conditions to form and retain atomic disorder in a nanocrystalline powder of the antimicrobial metal.